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Mellanox MLNX-EN-ESX Driver for VMware ESXi 5.1 and ESXi 5.5 User Manual

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Table of Contents

Chapter 1	Overview	2
1.1	Main Features Overview	2
Chapter 2	Driver Software	3
2.1	Installing and Running the offline_bundle Driver on ESXi-5.1 and ESXi-5.5	3
2.2	Removing the offline_bundle Driver	3
2.3	Driver Default Values	3
Chapter 3	Firmware Programming	6
Chapter 4	Additional Driver Settings	7
4.1	Changing Driver Default Values	7
4.1.1	Changing the Driver's Module Parameters Default Values Temporary	7
4.1.2	Changing the Driver's Module Parameters Default Values Permanently	7
4.2	Disabling/Enabling Automatic Load of the Driver upon Boot	7
4.3	Adding the Device as an uplink to an Existing Vswitch using the CLI	8
4.3.1	Locally	8
4.3.2	Remotely	8
4.3.3	Renaming the uplink Name	9

List of Tables

Table 1: mlx4_core Module Parameters	4
Table 2: mlx4_en Module Parameters	4

1 Overview

This document provides instructions for installing the MLNX-EN-ESX drivers for Mellanox Technologies ConnectX® family based network adapter cards in a VMware ESXi-5.1 and ESXi 5.5 server environment. The ConnectX® family adapters identify on the PCI bus as 25408, 25418, 25448, 26418, 26428, 26438, 26448, 26468, 26478, 26488, 25400, 27500, 27510, 27511, 27520, 27521, 27530, 27531, 27540, 27541, 27550, 27551, 27560, 27561.

1.1 Main Features Overview

- Single/Dual port
- MSI-X / Int-X
- NetQueue support
- Multiple Tx/Rx rings
- Hardware Tx/Rx checksum offload
- Large Send Offload (TCP Segmentation Offload)
- VLAN Tx/Rx acceleration (HW VLAN stripping/insertion)
- Ethtool support
- NAPI support
- Wake-on-Lan (WoL) (only on supported hardware)
- NC-SI
- Auto moderation
- Net dump (Only for ESXi5.5Ux)
- RSS Queues
- Fixed Pass-Through
- 10G
- 40G (Only for ESXi5.5Ux)

2 Driver Software

VMware uses a file package called a VIB (VMware Installation Bundle) as the mechanism for installing or upgrading software packages on an ESXi server.

MLNX-EN-ESX driver consists of 2 dependant kernel modules: `mlx4_core` (ConnectX® core driver) and `mlx4_en` (ConnectX® Ethernet driver), each with its own .vib file. In order to install the driver, both of the VIBs need to be installed together.

For this, MLNX-EN-ESX driver provides a bundle file, a zip file that contain each module VIB file and metadata file that describes the dependencies between them.

The following steps describe how to download, install, and run the driver.

2.1 **Installing and Running the `offline_bundle` Driver on ESXi-5.1 and ESXi-5.5**

1. Copy the `offline_bundle` zip file to the ESXi 5.1 or ESXi 5.5 machine.
2. Extract its contents.
3. Install the driver in one of the following ways:
 - a. Remove any earlier version of the driver from your VMware ESXi server machine prior to installing the new version.

```
#> esxcli software vib remove -n net-mlx4-en
#> esxcli software vib remove -n net-mlx4-core
```

- b. Install the `MLX4_EN` driver `offline_bundle` package.

```
#> esxcli software vib install -d <path>/MLNX-EN-ESX-1.9.9.0.zip
```

- c. Reboot ESXi server. (The driver will be loaded automatically).

➤ ***To verify that the driver is loaded:***

```
#> esxcli system module list | grep mlx4_core
#> esxcli system module list | grep mlx4_en
```

➤ ***To query network uplinks installed on your machine:***

```
#> esxcli network nic list
```

The number of uplinks claimed by `MLX4_EN` module should be displayed.

2.2 **Removing the `offline_bundle` Driver**

➤ ***To remove the `offline_bundle` driver package from the ESXi server machine:***

```
#> esxcli software vib remove -n net-mlx4-en
#> esxcli software vib remove -n net-mlx4-core
```

2.3 **Driver Default Values**

The below are `mlx4_en` and `mlx4_core` module parameters.

Some of these values can be changed by using module parameters, which can be obtained by running:

```
#> esxcli system module parameters list -m <module name>
```

For further information, please refer to [Section 4.1, “Changing Driver Default Values,” on page 7](#).

Table 1 - mlx4_core Module Parameters

Parameter	Description	Values
debug_level	Enables debug tracing.	<ul style="list-style-type: none"> • 1=enabled • 0=disabled [default: 0]
enable_64b_cqe_eqe	Enables 64 byte CQEs/EQEs when it is supported by the firmware.	<ul style="list-style-type: none"> • 1=enabled • 0=disabled [default: 0]
enable_qos	Enables Quality of Service support in the HCA.	<ul style="list-style-type: none"> • 1=enabled • 0=disabled [default: 0]
log_mtts_per_seg	Log2 number of MTT entries per segment.	1-7 [default: 3]
log_num_mgm_entry_size	Log2 MGM entry size, that defines the number of QPs per MCG. Not in use with device managed flow steering.	9, 10, 11, 12 [default: 12]
msi_x	Enables MSI-X,	<ul style="list-style-type: none"> • 1=enabled • 0=disabled [default: 1]
mtu_4k	Enables configuration of 4k MTU.	<ul style="list-style-type: none"> • 1=enabled • 0=disabled [default: 0]

Table 2 - mlx4_en Module Parameters

Parameter	Description	Values
inline_thold	Threshold for using inline data.	0-104 [default: 104]
netq	Uses netqueue.	<ul style="list-style-type: none"> • 1=enabled • 0=disabled [default: 1]
netq_num_rings_per_rss	Number of rings per RSS netqueue.	0, 2, 4 [default: 0]
pfcrx	Priority based Flow Control policy on RX. Per priority bit mask. It is 8 bits bit mask, each bit indicates priority [0-7]. Bit value: <ul style="list-style-type: none"> • 1 - respect incoming pause frames on the specified priority. • 0 - ignore incoming pause frames on the specified priority. 	0-255 [default: 0]

Table 2 - mlx4_en Module Parameters

Parameter	Description	Values
pfctx	<p>Priority based Flow Control policy on TX. Per priority bit mask. It's 8 bits bit mask, each bit indicates priority [0-7]. Bit value:</p> <ul style="list-style-type: none"> • 1 - generate pause frames according to the RX buffer threshold on the specified priority. • 0 - never generate pause frames on the specified priority. 	0-255 [default: 0]
udp_rss	Performs RSS for incoming UDP traffic.	<ul style="list-style-type: none"> • 1=enable • 0=disable [default: 0]
use_rx_frags	Uses RX frags.	<ul style="list-style-type: none"> • 1=enable • 0=disable [default: 0]

3 Firmware Programming

1. Download the [bootable binary image](#) (md5sum: e7b3e9357ca4045fabe2e8a95d951343) from the [Mellanox Firmware Tools \(MFT\)](#) site.
2. Install the image according to the steps described in the [README](#) file.



The following procedure requires custom boot image downloading, mounting and booting from a USB device.

4 Additional Driver Settings

4.1 Changing Driver Default Values

The driver's default values can be changed in one of the following methods:

4.1.1 Changing the Driver's Module Parameters Default Values Temporary

➤ *To temporary change the module parameters default values:*

1. Unload the driver.

```
#> esxcfg-module -u mlx4_core
#> esxcfg-module -u mlx4_en
```

2. Load the driver with the required parameters.

```
#> esxcfg-module mlx4_core <param name>=<value>
#> esxcfg-module mlx4_en <param name>=<value>
```

For example:

```
#> esxcfg-module mlx4_en netq=1,upd_rss=1
```



Unless set again, these parameters will be cleared to the driver's default values after next reload.



When changing the module parameter only in mlx4_en module, it is unnecessary to unload the mlx4_core module.

4.1.2 Changing the Driver's Module Parameters Default Values Permanently

➤ *To permanently change the module parameters default values:*

1. Query the available module parameters.

```
#> esxcli system module parameters list -m <module name>
```

2. Set the driver with the required parameters.

```
#> esxcli system parameters set -m <module name> -p <parameters list>
```

For example:

```
#> esxcli system module parameters set -m mlx4_en -p 'netq=1 udp_rss=1'
```

3. Verify that the parameters are set correctly.

```
#> esxcli system module parameters list -m <module name>
```

4.2 Disabling/Enabling Automatic Load of the Driver upon Boot

1. Query the driver auto load status.

```
#> esxcli system module list
```

2. Disable auto load on boot.

```
#> esxcli system module set -enabled=false -m mlx4_core
#> esxcli system module set -enabled=false -m mlx4_en
```

3. Enable auto load on boot.

```
#> esxcli system module set -enabled=true -m mlx4_core
#> esxcli system module set -enabled=true -m mlx4_en
```

4.3 Adding the Device as an uplink to an Existing Vswitch using the CLI

4.3.1 Locally

1. Log into the ESXi server with root permissions.
2. Find your device `uplink_name` under the “name” column.

```
#> esxcli network nic list
```

3. Add an uplink from a vSwitch.

```
#> esxcli network vswitch standard uplink add -u <uplink_name> -v
<vswitch_name>
```



Once you add a device via the CLI, it is visible in the vSphere client console, thus removing it can be performed via the UI.

4. Check that the uplink was added successfully.

```
#> esxcli network vswitch standard list -v <vswitch_name>
```

➤ ***To remove the device locally:***

1. Log into the ESXi server with root permissions.
2. Remove an uplink from a vSwitch.

```
#> esxcli network vswitch standard uplink remove -u <uplink_name> -v
<vswitch_name>
```

For additional documents, please refer to the VMware site:

https://pubs.vmware.com/vsphere-50/index.jsp?topic=%2Fcom.vmware.vcli.ref.doc_50%2Fesxcli_network.html

4.3.2 Remotely

1. Download and install VMware vSphere Management Assistant (vMA) from:

https://my.vmware.com/web/vmware/info/slug/datacenter_cloud_infrastructure/vmware_vsphere/5_5

2. Use the command “`vicfg-vswitch`” from the vMA environment.

For additional documents, please refer to the VMware site:

<https://www.vmware.com/support/pubs/vsphere-esxi-vcenter-server-pubs.html>

4.3.3 Renaming the uplink Name

The uplink naming format is in an increasing order, e.g. when working in either Multifunction Mode or Flex10 "vmnic0" to "vmnic7".

If the order is disrupted/inconsistent and you wish to correct, please follow the procedure below:

1. Log into the ESXi server with root permissions.
2. Open the "vi /etc/vmware/esx.conf" file.
3. Locate the /device/<PCI device>/vmkname = "vmnicX".
4. Change the vmnic numbers to the desired order.
5. Save the file.
6. Reboot the server.



Two vmnics with the same number cannot exist in the same ESXi server.